REMARKS/ARGUMENTS

Claims 1-35 and 37-43 are pending in the application. Claims 1-35 and 37-43 are rejected. Claims 1, 3-6, 8 and 40-43 have been amended. Claim 36 was previously cancelled. Claims 44-48 have been added. No new matter has been introduced. In view of the foregoing amendments and the following remarks, Applicants respectfully request allowance of Claims 1-35 and 37-48.

Applicants maintain all previous arguments made in the Amendment After Final filed December 29, 2009. In addition, applicants submit also that the subject matter recited by the foregoing amendments to the claims (discussed below at page 16) is not taught or suggested by the cited art.

PRIOR ART REJECTIONS - 35 USC §103

Claims 1, 9-11, 23-26 and 40 are rejected under 35 U.S.C. § 103(a) as being unpatentable over Hui (US 6,654,417 B1) in view of Chiang et al., A new rate Control Scheme Using Quadratic Rate Distortion NModel, IEEE, 1996, pgs. 73-76. Claims 2, 8, 27 and 33 are rejected as being unpatentable over Hui further in view of Chiang and further in view of Kim (US 5,777,812). Claims 3, 28 and 41 are rejected as being unpatentable over Hui in view of Chiang, in view of Kim and further in view of Simpson et al. (US 6,724,817 B1). Claims 4, 5, 29-30 and 42-43 are rejected as unpatentable over Hui, in view of Chiang, in view of Kim and further in view of Simpson and further in view of Sugiyama (US 6,940,911 B2). Claims 6-7, 31 and 32 are rejected as being unpatentable over Hui, in view of Chiang, further in view of Kim and further in view of Tsuru (US 6,950,040 B2). Claims 12-15 are rejected as being unpatentable over Hui. Claims 16 and 22 are rejected as being unpatentable over Hui in view of Kim. Claim 17 is rejected as being unpatentable over Hui in view of Kim and further in view of Simpson. Claims 18 and 19 are rejected as being unpatentable over Hui, in view of Kim and further in view of Sugiyama. Claims 20-21 are rejected as being unpatentable over Hui, in view of Kim, and further in view of Tsuru. Claims 34, 38 and 39 are rejected as being unpatentable over Hui in view of Sugiyama and further in view of Simpson. Claims 35 is rejected as unpatentable over Hui, further in view of Sugiyama and further in view of Simpson. Claim 37 is rejected as unpatentable over Hui, further in view of Sugiyama and further in view of Tsuru. Applicants respectfully request withdrawal of the outstanding rejections.

CLAIMS 1-11, 15, 19, 26, 30 AND 40-48 DEFINE OVER THE PRIOR ART

> Independent claim 1 recites in part:
>
> picture and a transmit buffer fullness indicator representing a quantity of stored previously-coded video data;
> […]
> a quantizer selector to generate a quantizer parameter for each picture from the first and second quantizer estimates; and
> a coding policy unit operative according to a rate control policy, wherein the rate control policy is informed by a comparison of the first and second quantizer estimates.

The combination of Hui and Chiang does not teach or suggest the rate and quality control system recited in representative claim 1, and independent claims 40, 44 and 48, which recite similar subject matter. As a threshold matter, Hui is not concerned with quantizer estimates and parameters for ***pictures***, but rather for ***macroblocks (MB)*** of pictures, as shown by, for example: "A rate controller 215 determines a reference quantization step size (QS_{ref}) for each MB…" (Hui, 9:19-20).

Moreover, the combination of Hui and Chiang also does not teach a first quantizer estimator to generate a first quantizer estimate for each picture based on the complexity indicators, a target coding rate calculated for each picture ***and a transmit buffer fullness indicator representing a quantity of stored previously-coded video data***. As teaching the transmit buffer fullness element, the Examiner cites the following from Hui:

> …where $D_{I,P,B}$ is ***virtual*** buffer fullness of corresponding I-, P-, or B-picture, updated (after coding each MB) by the difference between the bits used by the MB and the bits allocated to the MB based on the corresponding $T_{I,B,P}$…

(Hui, 9:30-34). (Emphasis Applicants'). Applicants respectfully disagree. The buffer referenced by Hui with respect to determining a reference quantization step size is a ***virtual*** buffer, not a ***transmit*** buffer as disclosed in the subject claim. Hui does disclose a transmit buffer, but it plays no role in determining quantization estimates: "The encoded bitstream is stored in an ***output buffer*** 207 of the encoder for output at 208 at desired data rates." (Hui, FIG. 2, 8:63-65). (Emphasis Applicants'). The Examiner cites also another section of Hui as teaching this element, which section recites in part:

> The bit allocation module 312 and the rate controller 315 take the updated BR_{target} from the target bitrate estimator 322 and perform necessary bit allocation and bit rate control such that the resulting compressed moving picture bitstreams will have encoded bit rate close to BR_{target}. Existing techniques of VBV (video

> buffer verifier) underflow detection and protection may be applied using BR_{max} as the reference bit rate to ensure the maximum bitrate of the output bitstream is not violated.

(Hui, 13:7-33). Applicants respectfully disagree. Neither this passage nor any other passage in Hui teaches a transmit buffer fullness indicator being used as a basis for the first quantizer estimator.

Furthermore, the cited art does not teach or suggest a quantizer selector to generate a quantizer parameter for each picture from the first and second quantizer estimates. As discussed above, Hui's QS_{ref} is concerned with macroblocks and not pictures, and while "QS_{target} may be used at the rate controller 215 as a lower limit for the final output QS_{ref} value," it is not a quantizer ***estimate*** for the picture, but rather is just a parameter set in advance of coding. (Hui, 9:4-5).

Finally, the cited art does not teach or suggest a coding policy unit operative according to a rate control policy, wherein the rate control policy is informed by a comparison of the first and second quantizer estimates. The rate control policy may inform various encoding decisions, such as, for example, those recited in amended claims 3-6. While Hui does teach modifying the value of BR_{target} (target bit rate) based on a comparison between QS_{target} and $QS_{average}$, this is not analogous to amended claim 1. First, bit rate (target or otherwise) is not controlled by the rate control policy recited in claim 1; indeed, the target bit rate already is known at this point, and actually is used by the first quantizer estimator to determine a ***first quantizer estimate***. Second, QS_{target}, as discussed above, is not a quantizer ***estimate*** for the picture, but rather is just a parameter set in advance of coding. (Hui, 9:4-5). Third, $QS_{average}$ also is not a quantizer ***estimate*** for the picture, but rather is the average QS value for the picture ***after it has been encoded***. (Hui, 9:48-58).

Because the combination of Hui and Chiang does not teach or suggest the above limitations, the combination does not render representative claim 1 obvious under § 103. Accordingly, Applicants believe that the rejections of independent claims 1 and 40 should be reconsidered and withdrawn. Claims 2-11 depend from independent claim 1 and are allowable for at least the reasons applicable to claim 1, as well as due to the features recited therein. Claims 41-43 depend from independent claim 40 and are allowable for at least the reasons applicable to claim 40 as well as due to the features recited therein. Applicants believe also that independent claims 44 and 48 are allowable for at least the reasons applicable to claim 1, as well as due to the features recited therein. Claims 45-47 depend from independent claim 44

and are allowable for at least the reasons applicable to claim 44, as well as due to the features recited therein.

Also, at least dependent claim 5, and dependent claims 19, 30 and 43, which recite certain subject matter similar to claim 5, define over the prior art. Representative dependent claim 5 recites:

> The rate and quality control system of claim 2, further comprising
>
> **a coding policy unit, to determine when it becomes necessary to eliminate motion vectors according to a rate control policy, and**
>
> wherein the AVC coder includes a prediction circuit that generates motion vectors for prediction of video data of macroblocks in the input pictures and of video data for sub-blocks therein of various sizes, the prediction circuit responsive to control from the coding policy unit, to **eliminate selected motion vectors from an output coded bitstream**.

The combination of Hui, Chiang, Kim, Sugiyama, and Simpson does not teach or suggest the above-highlighted elements of representative claim 5. In particular, the combination of Hui, Chiang, Kim, Sugiyama, and Simpson does not teach at least a coding policy unit, to determine when it becomes necessary to eliminate motion vectors according to a rate control policy. The Examiner cites various passages from Simpson as teaching this element, however Simpson is directed to adaptive ***image*** – not ***video*** – data compression, and consequently makes no mention of ***motion*** in any respect.

The Examiner cites Sugiyama as teaching the prediction circuit responsive to control from the coding policy unit, to eliminate selected motion vectors from an output coded bitstream. Applicants respectfully disagree. While Sugiyama may teach eliminating ***frames***, he does not teach eliminating ***motion vectors***.

For at least these reasons, Applicants believe that the rejections of claims 5, 19, 30 and 43 should be reconsidered and withdrawn.

Also, at least dependent claim 11, and dependent claims 15 and 26, which recite subject matter similar to claim 11, define over the prior art. Representative dependent claim 11 recites:

> The rate and quality control system of claim 1, wherein the complexity indicator includes an indicator of a number of bits used to represent each pixel in the picture.

The combination of Hui and Chiang does not teach or suggest an indicator of a ***number of bits*** used to represent each ***pixel*** in the picture, which indicator is used to influence the value of a quantizer estimate for a picture.

For at least these reasons, Applicants believe that the rejections of claims 11, 15 and 26 should be reconsidered and withdrawn.

CLAIMS 12-22 DEFINE OVER THE PRIOR ART

Independent claim 12 recites:

> Rate and quality control system for an AVC-based video coder, comprising:
>
> a content characteristics and coding rate analyzer, responsive to pictures from an input video sequence, to generate complexity indicators representative thereof,
>
> a target bits computer, responsive to the complexity indicators and to a picture type signal, to calculate a target coding rate for each picture in the video sequence,
>
> **a buffer based quantizer computer, responsive to the target coding rates, to a transmit buffer indicator signal and to the picture type signal, to generate a buffer-based quantizer estimate for each picture, and**
>
> **an activity based quantizer computer to calculate activity of each picture in the video sequence and modify the buffer-based quantizer estimate in response thereto,**
>
> **an AVC coder including a forward quantizer operative according to the modified buffer-based quantizer estimate.**

The combination of Hui does not teach or suggest the rate and quality control system recited in claim 12. In particular, Hui does not teach at least a buffer based quantizer computer, responsive to the target coding rates, to a transmit buffer indicator signal and to the picture type signal, to generate a buffer-based quantizer estimate for each picture. Please see relevant discussion above in conjunction with claim 1.

Given that Hui does not disclose a buffer-based quantizer computer as described in the subject claim, Hui cannot disclose an activity based quantizer computer to calculate activity of each picture in the video sequence ***and modify*** the ***buffer-based quantizer estimate*** in response thereto. Similarly, Hui also cannot disclose an AVC coder including a forward quantizer operative according to the ***modified buffer-based quantizer estimate***.

Furthermore, and as discussed above in conjunction with claim 1, Hui does not teach or suggest generating quantizer estimates for ***pictures***, but rather for ***macroblocks*** of pictures.

For at least these reasons, Applicants believe that the rejection of claim 12 should be reconsidered and withdrawn. Claims 13-22 depend from independent claim 12 and are

allowable for at least the reasons applicable to claim 12, as well as due to the features recited therein.

CLAIMS 23-33 DEFINE OVER THE PRIOR ART

Independent claim 23 recites in part:

> a rate model quantizer estimator, responsive to quantizers and coding rates of previously-coded pictures and to picture type indicators of input pictures, to estimate quantizer parameters of the input pictures according to a linear regression analysis, **wherein linear regression coefficients of input I pictures are selected according to the complexity indicators for such I pictures,**

The combination of Hui and Chiang does not teach or suggest the rate and quality control system recited in claim 23. In particular, the combination of Hui and Chiang does not teach at least wherein linear regression coefficients of input I pictures are selected according to the complexity indicators for such I pictures. Nowhere does Hui or Chiang disclose selecting linear regression coefficients of input I pictures ***according to complexity indicators***.

Furthermore, and as discussed above in conjunction with claim 1, Hui does not teach or suggest generating quantizer estimates for ***pictures***, but rather for ***macroblocks*** of pictures.

For at least these reasons, Applicants believe that the rejection of claim 23 should be reconsidered and withdrawn. Claims 24-33 depend from independent claim 23 and are allowable for at least the reasons applicable to claim 23, as well as due to the features recited therein.

CLAIMS 34-35 AND 37-39 DEFINE OVER THE PRIOR ART

Independent claim 34 recites in part:

> a rate controller having an input coupled to a source of video data and generating a quantizer selection on a picture-by-picture basis
>
> [...]
>
> wherein the video coding chain deletes motion vectors under control of the rate controller.

The combination of Hui, Sugiyama, and Simpson does not teach or suggest the video coding system recited in independent claim 34. In particular, the combination of Hui, Sugiyama, and Simpson does not teach wherein the video coding chain deletes ***motion vectors*** under control of the rate controller. Claim 34 recites subject matter similar to claims 5, 19, 30, and 43, and Applicants direct the Examiner to the above arguments (page 16) regarding those claims.

Furthermore, and as discussed above in conjunction with claim 1, Hui does not teach or suggest generating quantizer selections on a ***picture-by-picture*** basis, but rather on a ***macroblock-by-macroblock*** basis.

For at least these reasons, Applicants believe that the rejection of claim 34 should be reconsidered and withdrawn. Claims 35 and 37-39 depend from independent claim 34 and are allowable for at least the reasons applicable to claim 34, as well as due to the features recited therein.

In view of the above amendments and arguments, it is believed that the above-identified application is in condition for allowance, and notice to that effect is respectfully requested. Should the Examiner have any questions, the Examiner is encouraged to contact the undersigned at (408) 975-7963.

The Commissioner is authorized to charge any fees or credit any overpayments which may be incurred in connection with this paper under 37 C.F.R. §§ 1.16 or 1.17 to Deposit Account No. **11-0600**.

Respectfully submitted,

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